REMARKS/ARGUMENTS

Claims 1-13 are pending. Claim 1 is currently amended to include "a distance between the source electrode and the drain electrode being 1 μm to 1mm" which is supported by the specification: pg 71, lines 11-15. New claim 9 shares support with amended claim 1. New claim 10 finds support in the specification: pg 71, lines 16-22. New claims 11 and 12 find support in Devices B-D of Figures 2-4. New claim 13 finds support in the specification: Table 1 (pgs 78-80), Example 52 on pg 79. No new matter has been entered.

With respect to the 35 U.S.C. §103(a) rejection in view of Iechi, Baldo and Taguchi, Applicants submit that these references do not render obvious the present claims. Claim 1 as amended requires the distance between the source electrode and the drain electrode be 1 μm to 1mm, resulting in the organic thin film transistor ("OTFT") being a horizontal OTFT (see Figs. 1-4) instead of a vertical OTFT (see Figs. 5 and 6). In contrast, Iechi and Baldo disclose vertical OTFTs with the distance between the source electrode and the drain electrode being considerably below 1 μm. For example, Iechi teaches a distance between the source electrode and the drain electrode being approximately 2000Å (or 0.2 μm).[1] Similarly, Baldo teaches a distance between the source electrode and the drain electrode being 550nm (or 0.55 μm) at the most.[2] Therefore, neither Iechi nor Baldo, nor the combination of the two, disclose or suggest an OTFT structure having the distance between the source electrode and the drain electrode being 1 μm to 1mm.

Accordingly, Iechi and Baldo lack the teaching or suggestion of the distance parameter of Applicants' claim 1. However, the inclusion of the compound of Taguchi with either or both of Iechi and Baldo does not remedy this deficiency. Therefore, the compound

[1] See Embodiments 1-5 ([0064]-[0095]), where the total thickness of the organic semiconductor layers is 2000Å and the distance between the source electrode and the drain electrode can be considered almost the same because the thickness of the gate electrodes are 10nm or less ([0053]).

[2] The thickness of each of two organic semiconductor layer is preferably 20-200nm ([0072]), the thickness of each of two insulating layers is preferably 5-50nm ([0071]), and the thickness of the grid is preferably about 10-50nm ([0069]).

of Taguchi as a semiconductor layer of the device of Iechi, as modified by Baldo, would not teach or suggest Applicants' claim 1 as is suggested by the Examiner (Office Action, pg 3, 3rd para.).

Furthermore, horizontal OTFTs require high field effect mobility for the semiconductor layer, and materials frequently used for semiconductor layers of electroluminescent devices have low field effect mobilities. Therefore, one skilled in the art would not look to electroluminescent devices (i.e. Taguchi) for material to be used in the semiconductor layer of a horizontal OTFT (i.e. Applicants' claim 1). This is discussed below in further detail.

In horizontal OTFT structures the source electrode and the drain electrode are farther apart than that of vertical OTFTs, and the carriers must stream for a longer distance compared to that of vertical OTFT structures. Thus, when a horizontal OTFT device structure is employed, high field effect mobility is required for the semiconductor layer because field effect mobility is inversely proportional to the square of the distance between the source electrode and the drain electrode.[3]

Moreover, it was well known at the time the invention was made that semiconductor materials having practical drift mobility for electroluminescence devices are usually not employable for OTFT devices because of their *low* field effect mobility. The reason for this is that when an electroluminescence device structure is employed, carriers stream for a shorter distance than those of a horizontal OTFT. Also, carriers of an electroluminescence device stream within the organic semiconductor layer, whereas carriers of a horizontal OTFT stream on the interface of the semiconductor layer and the insulating layer and they tend to be trapped on this interface. Therefore, a semiconductor material for a horizontal OTFT device

[3] Response speed is expressed as switching time which is proportional to the square of the distance between the source electrode and the drain electrode, and is also proportional to the inverse number of the field effect mobility.

is required to have extremely high field effect mobility. Thus, the low field effect mobility of the semiconductor materials of electroluminescence devices would not be practical.

Listed below are frequently employed semiconductor materials for electroluminescence devices and their respective mobilities (the references cited are submitted herewith).

(1) Kayashima et al. (Abstract and page L179, left column, lines 15-18): polyphenylenevinylene ("PPV"), field effect electron mobility as low as 1.0×10^{-6}cm^2/Vs.
(2) Saragi et al. (Table 2): N,N'-diphenyl-N,N'-bis(1-naphthyl)-1,1'-biphenyl-4,4'- diamine ("α-NPB") and N,N'-bis(3-methylphenyl)-(1,1'-biphenyl)-4,4'-diamine ("TPD"), field effect hole mobilities of 6.1×10^{-5}cm^2/Vs and 8.7×10-^{5}cm^2/Vs respectively.[4]
(3) Tsuji et al. (page 356, lines 5-7): a TPD layer, hole mobility of 7.2×10^{-4}cm^2/Vs.
(4) Crone et al. (page 3163, left column, lines 30-31, and right column, lines 3-5): poly[2-methyoxy, 5-(2'-ethyl-hexyloxy)-1,4-phenylene vinylene] ("MEH-PPV"), electron and hole mobilities of 10^{-7}cm^2/Vs and 3×10^{-4}cm^2/Vs respectively.
(5) J. W. Jang et al. (Fig. 3): a MEH-PPV/Alq_3 bilayer, recombination mobility of approximately 2×10^{-4}cm^2/Vs.

In contrast to the above examples, representative field effect mobilities of the Example embodiments in the present specification were determined to be 1.0×10^{-3} cm^2/Vs or more (see Example 52 for the smallest mobility).[5] Therefore, as illustrated above by Kayashima et al., Saragi et al., Tsuji et al., Crone et al., and J.W. Jang et al., those materials frequently used for semiconductor layers of electroluminescence devices show unsatisfactorily low field effect mobilities (i.e. from 2×10^{-4} cm^2/Vs to 1×10^{-7} cm^2/Vs).

Thus, due to the unsatisfactory field effect mobilities of the materials frequently used for semiconductor layers of electroluminescent devices, one skilled in the art would have lacked both the motivation and the expectation of success in including a material used in a

[4] Saragi et al. mention that drift mobilities of α-NPB and TPD, expressed in time of flight (TOF), are reported as 5.1×10^{-4}cm^2/Vs and 1×10^{-3}cm^2/Vs respectively, and thereby it is seen that field effect mobility and drift mobility are different properties. It should also be noted that OTFT device structures employed in these estimations is substantially the same as device A as disclosed in the specification and Fig. 1 of the present application.
[5] This is 1000 times higher than the field effect electron mobility of the device of Iechi.

semiconductor layer of an electroluminescent device as the semiconductor layer of a horizontal OTFT. Therefore, since Taguchi relates to organic electroluminescent devices, one skilled in the art would not have looked to Taguchi for material to be used in the semiconductor layer of a horizontal OTFT. Consequently, even if Iechi and/or Baldo taught horizontal OTFTs (which they do not) the use of the compound of Taguchi as a semiconductor layer of the device of Iechi, as modified by Baldo, would not be obvious.

Even further, Applicants submit that it is not obvious for a person skilled in the art to select nitrogen-containing compounds as the semiconductor layer of a horizontal OTFT. For example, Naka et al. (submitted herewith) discloses that the electron and hole mobility of tris(8-quinolinolato)aluminum ("Alq_3") is only $3 \times 10^{-6} cm^2/Vs$ and $4 \times 10^{-8} cm^2/Vs$ respectively (see page 332, left column, lines 8-11).[6] Also, Matsusue et al. (submitted herewith) discloses that the hole and electron drift mobilities of Bis(2-(2'-benzo[4,5-a] thienyl)pyridinato-N,$C^{3'}$)iridium(acetylacetonate) are $2.9 \times 10^{-4} cm^2/Vs$ and $2.4 \times 10^{-5} cm^2/Vs$ respectively (see page 3692, right column, lines 5-7). Therefore, one could conclude that high mobility is not necessarily achieved by including nitrogen-containing compounds as the semiconductor layer of a horizontal OTFT. Thus, a person of ordinary skill in the art would lack the motivation to include the nitrogen-containing compound of an organic electroluminescence device (i.e. Taguchi) as the semiconductor layer of a horizontal OTFT.

Lastly, with respect to the 35 U.S.C. §103(a) rejection in view of Iechi, Baldo and Ueda, Applicants submit that these references do not render obvious the present claims. Ueda relates to organic electroluminescent elements, and is therefore similar to Taguchi in that manner. Applicants submit that the above discussion with respect to Taguchi and its combination with Iechi and Baldo also holds true for Ueda and its combination with Iechi and Baldo. Namely, and in summary, the combination of Iechi, Baldo and Ueda do not render

[6] It should be noted that Alq_3 is a compound containing nitrogen which is frequently employed for organic electroluminescence devices.

obvious Applicants claims for the following reasons: (1) neither Iechi nor Baldo, nor the combination of the two, disclose or suggest an OTFT structure having the distance between the source electrode and the drain electrode being 1 μm to 1mm; (2) due to the unsatisfactory field effect mobilities of the materials frequently used for semiconductor layers of electroluminescent devices (i.e. Ueda), one skilled in the art would have lacked both the motivation and the expectation of success in including a material used in a semiconductor layer of an electroluminescent device as the semiconductor layer of a horizontal OTFT; and (3) a person of ordinary skill in the art would lack the motivation to include the nitrogen-containing compound of an organic electroluminescence device (i.e. Ueda) as the semiconductor layer of a horizontal OTFT.

For the reasons discussed above, Applicants submit that all now-pending claims are in condition for allowance. Applicants respectfully request the withdrawal of the rejections and passage of this case to issue.

Respectfully submitted,

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